# 1.0 Radiological, Nuclear and Process Safety Objectives

**Safety Criterion:** 1.0 - 1

A comprehensive radiological and process safety management program shall be used to eliminate or reduce the incidence, or mitigate the consequences of, accidental radioactive or chemical releases, process fires, and process explosions. This program shall address management practices, technologies, and procedures. Radiological and process safety management shall confirm that the facility is properly designed, the integrity of the design is maintained, and the facility is operated according to the safe manner intended.

**Implementing Codes and Standards:**

~~BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan~~
~~Section: 4.1 Safety Management Processes~~
~~Chapter: 5.0 Process Safety Management~~
BNFL-5193-SRD-01 TWRS-P Project Safety Requirements Document
Appendix A Implementing Standard for Safety Standards and Requirements Identification

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 10*~~
*DOE/RL-96-0006 5.1.1 Process Safety Management*
*DOE/RL-96-0006 5.1.2 Process Safety Objective*

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**Safety Criterion:** 1.0 - 2

Principal emphasis shall be placed on the prevention of accidents, particularly any that could cause an unacceptable release, as the primary means of achieving safety.

**Implementing Codes and Standards:**

BNFL-5193-SRD-01, Appendix A Implementing Standard for Safety Standards and Requirements Identification
DOE IG Implementation Guide for Nonreactor Nuclear Safety Design Criteria and Explosive Safety Criteria, 2.3
DOE Order 420.1 Facility Safety, 4.1.1.2

**Regulatory Basis:**

*DOE/RL-96-0006 4.1.1.2 Defense in Depth-Prevention*

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**Safety Criterion:** 1.0 - 3

The risk, to an average individual within 1 mile of the TWRS-P Controlled Area Boundary, of prompt fatalities that might result from an accident shall not exceed one-tenth of one percent (0.1%) of the sum of prompt fatality risks resulting from other accidents which members of the U.S. population generally are exposed.

**Implementing Codes and Standards:**

BNFL-5193-SRD-01, Appendix A, Implementing Standard for Safety Standards and Requirements Identification
BNFL-5193-SRD-01, Appendix D, Radiological Exposure Standards for the TWRS-P Project

**Regulatory Basis:**

*DOE/RL-96-0006 3.1.2 Accident Risk Goal*

**Safety Criterion:** 1.0 - 7

To compensate for potential human and equipment failures, a defense-in-depth strategy shall be applied to the facility commensurate with the hazards; such that, as appropriate to control the risk, safety is vested in multiple, independent safety provisions, no one of which is to be relied upon excessively to protect the public, the workers, or the environment. This strategy shall be applied to the design and operation of the facility.

**Implementing Codes and Standards:**

ANSI/ANS 58.9-1981 Single Failure Criteria for Light Waster Reactor Safety-Related Fluid Systems
BNFL-5193-SRD-01, Appendix B Implementing Standard for Defense in Depth
DOE IG Implementation Guide for Nonreactor Nuclear Safety Design Criteria and Explosive Safety Criteria, 2.3
DOE Order 420.1 Facility Safety 4.1.1.2
IEEE 379-1994 Application of the Single Failure Criterion to Nuclear Power Generating Station Safety Systems

**Regulatory Basis:**

*DOE/RL-96-0006 4.1.1.1 Defense in Depth-Defense in Depth*

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**Safety Criterion:** 1.0 - 8

Structures, systems, and components (SSCs) that serve to provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the workers and the public are classified as Important to Safety. It encompasses the broad class of facility features addressed (not necessarily explicitly) in the top-level radiological, nuclear, and process safety standards and principles that contribute to the safe operation and protection of workers and the public during all phases and aspects of facility operations (i.e., normal operation as well as accident mitigation). This definition includes not only those structures, systems, and components that perform safety functions and traditionally have been classified as safety class, safety-related or safety-grade, but also those that place frequent demands on or adversely affect the performance of safety functions if they fail or malfunction, i.e., support systems, subsystems, or components. Thus, these latter structures, systems, and components would be subject to applicable top-level radiological, nuclear, and process safety standards and principles to a degree commensurate with their contribution to risk. In applying this definition, it is recognized that during the early stages of the design effort all significant systems interactions may not be identified and only the traditional interpretation of Important to Safety, i.e., safety-related may be practical. However, as the design matures and results from risk assessments identify vulnerabilities resulting from non-safety-related equipment, additional structures, systems, and components should be considered for inclusion within this definition.

Important to Safety includes SSCs designated as Safety Design Class and Safety Design Significant.

Safety Design Class SSCs includes those that, by performing their specified safety function, prevent workers or the maximally exposed member of the public from receiving a radiological or chemical exposure that exceeds the exposure standards defined in the SRD. ~~Safety Design Class also applies to those features that by functioning, prevent the worker or maximally exposed member of the public from receiving a chemical exposure that exceeds the ERPG-2 (AIHA 1988) chemical release standard.~~ Those features credited for the prevention of a criticality event are also designated as Safety Design Class.

Safety Design Significant SSCs are those needed to achieve compliance with the radiological or chemical exposure standards for the public and workers during normal operation; and SSCs that can, if they fail or malfunction, place frequent demands on, or adversely affect the function of, Safety Design Class SSCs.

Notes

(1) In addition to meeting the listed design objective of 10 CFR 835.1002(b), the inhalation of radioactive material by workers and co-located workers under normal conditions is kept ALARA through the control of airborne radioactivity as described in 10 CFR 835.1002(c).
(2) In addition to meeting the listed worker and co-located worker exposure standards for accidents, the Worker Accident Risk Goal is satisfied through the calculation of the risk from accidents with accident prevention and mitigation features added as necessary to meet the Goal.
(3) In addition to meeting the listed exposure standards for accidents, BNFL's approach to accident mitigation is to evaluate accident consequences to ensure that the calculated exposures are far enough below standards to account for uncertainties in the analysis, and to provide for sufficient design margin and operational flexibility.
(4) When a calculated accident exposure exceeds this threshold, then appropriate actions are taken. These include carrying out a less bounding (i.e., more realistic) evaluation to show that the accident consequences will be below the threshold or evaluating additional safeguards for cost-effectiveness and/or feasibility. This threshold is not a limit; it does not require the implementation of additional preventative or mitigative features if they are not both cost-effective and feasible.

**Implementing Codes and Standards:**
BNFL-5193-SRD-01, Appendix A, Implementing Standard for Safety Standards and Requirements Identification
BNFL-5193-SRD-01, Appendix D, Radiological Exposure Standards for the TWRS-P Project

**Regulatory Basis:**

*DOE/RL-96-0006 2.1 Individual (Dose Standards Above Normal Background)*

**Safety Criterion:** 2.0 - 2

The following ~~dose~~ standards shall be applied to protect the public and workers from TWRS-P chemical hazards.

Releases ~~impacting~~ exposing the offsite public to ERPP~~R~~G-2 ~~limits~~ concentrations (AIHA 1999~~88, as amended~~)

Releases ~~impacting~~ exposing the co-located worker to ERPP~~R~~G-~~2~~3 ~~limits~~ concentrations (AIHA 1999~~88, as amended~~)

Releases exposing the facility worker to concentrations high enough to cause in-patient hospitalization of at least 3 facility workers, or at least a single fatality.

Where ERPG values have not been published, the DOE Temporary Emergency Exposure Limits (TEELs) may be used as substitute ERPGs.

**Implementing Codes and Standards:**
BNFL-5193-SRD-01, Appendix A, Implementing Standard for Safety Standards and Requirements Identification

# 3.0 Nuclear and Process Safety

## 3.1 Hazards Analysis

**Safety Criterion:** 3.1 - 1

An initial process hazard analysis (hazard evaluation) shall be performed using acceptable industry practices. The analysis shall include consideration of both chemical and radiological hazards. The process hazard analysis shall be appropriate to the complexity of the process and shall identify, evaluate, and document the design features which control the hazards involved in the process.

The process hazard analysis shall be performed by a team with expertise in engineering and process operations, and the team shall include at least one member who has experience and knowledge specific to the process being evaluated. Also, one member of the team must be knowledgeable in the specific process hazard analysis methodology being used.

**Implementing Codes and Standards:**

~~BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan~~
~~Section: 1.3.4 Process Hazards Analysis~~
~~Section: 5.5 Process Hazards Analysis~~
BNFL-5193-SRD-01 TWRS-P Project Safety Requirements Document
Appendix A Implementing Standard for Safety Standards and Requirements Identification

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (e)*~~
~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (p)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 50*~~
*DOE/RL-96-0006 5.2.2 Process Hazard Analysis*

**Safety Criterion:** 3.1 - 2

A compilation of written process safety information appropriate to the stage of design being considered shall be completed ~~before conducting~~to support the process hazard analysis. The compilation of written process safety information enables the employer and the employees involved in operating the process to identify and understand the hazards posed by those processes involving radioactive materials and process chemicals considered to pose a hazard. This process safety information shall include information pertaining to the hazards of the materials used or produced by the process, information pertaining to the technology of the process, and information pertaining to the equipment in the process.

(1) Information pertaining to the hazards of the materials in the process including:
(a) Toxicity information;
(b) Permissible exposure limits;
(c) Physical data;
(d) Reactivity data:
(e) Corrosivity data;
(f) Thermal and chemical stability data; and
(g) Hazardous effects of inadvertent mixing of different materials that could foreseeably occur.

(2) Information pertaining to the technology of the process including at least the following:
(a) A block flow diagram or simplified process flow diagram;
(b) Process chemistry;
(c) Maximum intended inventory;
(d) Safe upper and lower limits for such items as temperatures, pressures, flows or compositions; and,
(e) An evaluation of the consequences of deviations, including those affecting the safety and health of employees.

(3) Information pertaining to the equipment in the process including:
(a) Materials of construction;
(b) Process drawings or piping and instrument diagrams (P&ID's);
(c) Electrical classification;
(d) Relief system design and design basis;
(e) Ventilation system design;
(f) Design codes and standards employed;
(g) Material and energy balances; and
(h) Safety systems (e.g. interlocks, detection or suppression systems).

The records shall be maintained documenting that equipment complies with recognized and generally accepted good engineering practices. The safety information shall be kept up-to-date.

**Implementing Codes and Standards:**

~~BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan~~
~~Section: 5.1 Process Safety Information~~
BNFL-5193-SRD-01 TWRS-P Project Safety Requirements Document
Appendix A Implementing Standard for Safety Standards and Requirements Identification

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (d)*~~
~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (p)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 48*~~
*DOE/RL-96-0006 5.2.1 Process Safety Information*
*DOE/RL-96-0006 5.2.2 Process Hazard Analysis*

**Safety Criterion:** 3.1 - 3

The process hazard analysis shall address:
(1) The hazards of the process;
(2) Engineering and administrative controls applicable to the hazards and their interrelationships such as appropriate application of detection methodologies to provide early warning of releases. (Acceptable detection methods might include process monitoring and control instrumentation with alarms, and detection hardware.);
(3) Consequences of failure of engineering and administrative controls;
(4) Facility siting;
(5) Human factors; and
(6) A qualitative evaluation of a range of the possible safety and health effects of failure of controls on employees in the workplace.
(7) Common-mode and common-cause failure events.

**Implementing Codes and Standards:**

~~BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan~~
~~Section: 1.3.4 Process Hazards Analysis~~
~~Section: 5.5 Process Hazards Analysis~~
BNFL-5193-SRD-01 TWRS-P Project Safety Requirements Document
Appendix A Implementing Standard for Safety Standards and Requirements Identification

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (e)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 50*~~
*DOE/RL-96-0006 5.2.2 Process Hazard Analysis*

**Safety Criterion:** 3.1 - 4

The hazard analysis shall be performed in accordance with the following requirements:
(1) The consequences of unmitigated releases of radioactive material and process chemicals considered to pose a hazard shall be evaluated.

(2) The hazard analysis shall be based on an inventory of all radioactive and hazardous nonradioactive materials that are stored, utilized, or may be formed within the facility.

(3) The hazard analysis shall identify energy sources or processes that might contribute to the generation or uncontrolled release of radioactive or process chemicals considered to pose a hazard. The hazard analysis shall estimate the consequences of accidents in which the facility or process and/or materials in the inventory are assumed to interact, react, or be released in a manner to produce a threat or challenge to the health and safety of individuals on-site and off site.

(4) The risks that hazardous inventories and energy sources present shall be evaluated by consideration of normal operation (including startup, testing and maintenance), anticipated operational occurrences, and accident conditions. The identification of anticipated operational occurrences and accident conditions shall consider internal events (i.e., equipment failure and human error), external events (e.g., nearby facilities and transportation), and natural phenomena.

**Implementing Codes and Standards:**

~~BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan~~
~~Section: 1.3.4 Process Hazards Analysis~~
~~Section: 5.5 Process Hazards Analysis~~
BNFL-5193-SRD-01 TWRS-P Project Safety Requirements Document
Appendix A Implementing Standard for Safety Standards and Requirements Identification

**Regulatory Basis:**

*DOE/RL-96-0006 3.3.3 Accident Vulnerability Mitigation*
*DOE/RL-96-0006 5.2.2 Process Hazard Analysis*

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**Safety Criterion:** 3.1 - 5

A written plan of action shall be developed regarding employee participation in the conduct and development of process hazards analyses and on the development of process safety management. Employees and their representatives shall be consulted on the conduct and development of process hazards analyses and on the development of the other elements of process safety management. Employees and their representatives shall be provided access to process hazard analyses and other information developed related to process safety.

**Implementing Codes and Standards:**

~~BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan~~
~~Section: 5.5 Process Hazards Analysis~~
BNFL-5193-SRD-01 TWRS-P Project Safety Requirements Document
Appendix A Implementing Standard for Safety Standards and Requirements Identification

**Regulatory Basis:**

~~*29 CFR 1910 - Occupational Safety and Health Standards - Location: 119 (c)*~~

**Safety Criterion:** 3.1 - 6

A system shall be established to promptly address the hazard analysis team's findings and recommendations; assure that the recommendations are resolved in a timely manner and that the resolution is documented. The contractor shall document what actions are to be taken; complete actions; develop a written schedule of when these actions are to be completed; communicate the actions to operating, maintenance and other employees whose work assignments are in the process and who may be affected by the recommendations or actions.

**Implementing Codes and Standards:**

BNFL-5193-SRD-01, Appendix A Implementing Standard for Safety Standards and Requirements Identification

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (e)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 50*~~
*DOE/RL-96-0006 5.2.2 Process Hazard Analysis*

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**Safety Criterion:** 3.1 - 7

~~At least every five (5) years after the completion of the initial process hazard analysis, t~~The process hazard analysis shall be updated ~~and revalidated~~ to reflect changes concurrently with the annual update of the FSAR by a qualified team, to assure that the process hazard analysis is consistent with the current process.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 3.3.3 Changes to Safety Documentation
Section: 5.6.2 Updating of the Hazard Analysis Report

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (e)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 50*~~
*DOE/RL-96-0006 5.2.2 Process Hazard Analysis*

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**Safety Criterion:** 3.1 - 8

Employers shall retain process hazards analyses and updates or revalidations as well as the documented resolution of any recommendations for the life of the process.

**Implementing Codes and Standards:**

~~BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan~~
~~Section: 5.5 Process Hazards Analysis~~
~~Chapter: 8.0 Document Control and Maintenance~~
BNFL-5193-SRD-01 TWRS-P Project Safety Requirements Document
Appendix A Implementing Standard for Safety Standards and Requirements Identification

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (e)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 50*~~

# 4.0 Engineering and Design

**Safety Criterion:** 4.0 - 1

Formal configuration management shall be applied to all facility activities through deactivation of the TWRS-P facility to ensure that programmatic objectives, including safety, are fully achieved. Work shall be performed and controlled according to pre-approved plans and procedures that clearly delineate responsibility. Documented records shall be retained.

**Implementing Codes and Standards:**

ISO 10007 Quality Management – Guidelines for Configuration Management

**Regulatory Basis:**

*DOE/RL-96-0006 4.1.5.1 Configuration Management-Formal Configuration Management*

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**Safety Criterion:** 4.0 - 2

Written procedures shall be established and implemented to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures; and, changes to facilities that affect a covered process. The procedures shall assure that the following considerations are addressed prior to any change:

(1) The technical basis for the proposed change;
(2) Impact of change on safety and health;
(3) Modifications to operating procedures;
(4) Necessary time period for the change; and,
(5) Authorization requirements for the proposed change.

Employees involved in operating a process and maintenance and subcontract employees whose job tasks will be affected by a change in the process shall be informed of, and trained in, the change prior to start-up of the process or affected part of the process. If a change covered by this paragraph results in a change in the process safety information, such information shall be updated accordingly. If a change covered by this paragraph results in a change in operating procedures or practices, such procedures or practices shall be updated accordingly.

**Implementing Codes and Standards:**

ISO 10007 Quality Management – Guidelines for Configuration Management

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (l)*~~
*DOE/RL-96-0006 5.2.9 Management of Change*

**Safety Criterion:** 4.1 - 3

This criterion addresses natural phenomena hazards (NPH) design for structures, systems, and components (SSCs) that are Important to Safety and have NPH safety functions.

SSCs designated as Important to Safety (i.e., Safety Design Class and Safety Design Significant) shall be designed to withstand the effects of NPH events such as earthquakes, wind, and floods without loss of capability to perform specified safety functions required as the result of the NPH events. This includes both the front line and support systems that must function for a NPH event such that the public, co-located worker, or facility worker exposure standards of Safety Criterion 2.0-1 or 2.0-2 are not exceeded.

SSCs that are designated Safety Design Class (excepting those so designated based solely on chemical hazards) and that are required to perform a safety function as a result of a given NPH shall be designed to withstand the NPH loadings of that NPH as provided in Table 4-1. These SSCs are designated Seismic Category I (SC-I) for earthquakes and Performance Category 3 (PC-3) for other NPH. SSCs designated as SDC based solely on a safety function relative to chemical hazards shall be designated as SC-III for earthquakes, and shall be designed to meet PC-3 requirements for other NPH events.

SSCs that are designated Safety Design Significant whose continued function is not required for an NPH event, but whose failure as a result of an NPH event could reduce the functioning of a Safety Design Class SSC such that exposure standards might be exceeded, shall be designed to withstand the NPH loadings of that NPH as provided in Table 4-1. For these SSCs, however, for seismic response only, credit may be taken for inelastic energy absorption per Table 2-4 of DOE-STD-1020-94. These SSCs are designated SC-II for earthquakes and PC-3 for other NPH. SSCs designated as SDS based solely on a safety function relative to chemical hazards shall be designated as SC-III for earthquakes, and shall be designed to meet PC-3 requirements for other NPH events.

For any SSC included under this criterion, other NPH loads (for which the SSC has no safety function) may be taken from Safety Criterion 4.1-4 and Table 4-2 in lieu of Safety Criterion 4.1-3 and Table 4-1. SSCs designated as SDS based solely on safeguarding a safety function relative to chemical hazards shall be designated SC-III for earthquakes, and shall be designed to meet PC-2 requirements for other NPH events.

**Safety Criterion:** 4.1 - 4

This criterion addresses natural phenomena hazards (NPH) design for structures, systems, and components (SSCs) without NPH safety functions.

SSCs that may be important to the safety of the TWRS-P Facility shall be designed to withstand the effects of NPH such as earthquakes, wind, and floods. The SSCs included under this criterion are:

1. SSCs Important to Safety (either Safety Design Class or Safety Design Significant) that do not have an NPH safety function~~; and~~,
2. SSCs that are not Important to Safety and that have significant inventories of radioactive or hazardous materials but in amounts less than quantities that might lead to an Important to Safety designation, and~~.~~
3. SSCs that are important to safety because of their function to protect workers and members of the public from exposure to chemical hazards.

These SSCs are designated Seismic Category III (SC-III) for earthquakes and Performance Category 2 (PC-2) for other NPH.

SSCs included under this criterion shall be designed to withstand the NPH loadings as provided in Table 4-2.

**Table 4-2 Natural Phenomena Design Loads for SSCs without NPH Safety Functions**

| Hazard | Load | Source Document for Load |
|---|---|---|
| Seismic | Uniform Building Code [a], Static Force Procedure | DOE-STD-1020-94 [b] |
| Straight wind | 91 mi/hr 3-second gust, at 33 ft above ground, Importance factor, I=1.00 | DOE Newsletter [c] |
| Wind Missile | Not Applicable | DOE-STD-1020-94 [b] |
| Tornado and Tornado Missiles | Not Applicable | DOE-STD-1020-94 [b] |
| Volcanic ash | 5 $lb/ft^2$ | HNF-SD-GN-ER-501 [d] |
| Flooding | Dry site for river flooding<br>Local Precipitation: 2.5 in. for 6 hours | HNF-SD-GN-ER-501 [d] |
| Snow | 15.0 $lb/ft^2$ snow load | HNF-SD-GN-ER-501 [d] |

[a] 1997, *Uniform Building Code*, International Conference of Building Officials, Whittier, California.
[b] DOE STD-1020-94, *Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities*, U.S. Department of Energy, Washington, D.C., Change 1, 1996.
[c] DOE Newsletter (Interim Advisory on Straight Winds and Tornados) Dated 1/22/98
[d] HNF-SD-GN-ER-501, Rev. 1, "Natural Phenomena Hazards, Hanford Site, South-Central Washington, " Westinghouse Hanford Company

The possibility of human error in facility operations shall be taken into account in the design by facilitating correct decisions by operators and inhibiting wrong decisions and by providing means for detecting and correcting or compensating for error. The parameters to be monitored in control areas shall be selected and their displays arranged to ensure operators have clear and unambiguous indication of the status of the facility. The parameters and displays shall facilitate monitoring and the initiation and operation of systems designated as Important to Safety.

**Implementing Codes and Standards:**

BNFL-5193-SRD-01, Appendix B Implementing Standard for Defense in Depth
IEEE 1023-88 Guide for the Application of Human Factors Engineering to Systems, Equipment, and Facilities of Nuclear Power Generating Stations

**Regulatory Basis:**

*DOE/RL-96-0006 4.1.1.6 Defense in Depth-Human Aspects*
*DOE/RL-96-0006 4.2.6.1 Human Factors-Human Error*
*DOE/RL-96-0006 4.2.6.2 Human Factors-Instrumentation and Control Design*
*DOE/RL-96-0006 4.2.6.3 Human Factors-Safety Status*

**Safety Criterion:** 4.3 - 7

The control room or control area shall be designed to permit occupancy and actions to be taken to monitor the facility safely during normal operations, and to provide safe control of the facility for anticipated operational occurrences and accident conditions. If credit is taken for operator action to satisfy the accident exposure standards of Safety Criteria 2.0-1 and/or 2.0-2, adequate radiation protection shall be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 5 rem whole body gamma and 30 rem beta skin for the duration of the accident. For occurrences and accidents involving chemical release, provisions shall be made such that the operator exposure does not exceed the worker exposure standards of ~~Safety Criterion 2.0-2~~29 CFR 1910.120 for emergency exposure.

Consideration shall also be given to accidents at nearby facilities if operator action is required to safely control the processes and bring them to a safe state.

The need for an alternate system that would allow the processes to be placed in a safe state in the event the primary control area is uninhabitable shall be evaluated.

**Implementing Codes and Standards:**

ASME N509-89 Nuclear Power Plant Air Cleaning Units and Components
ASME N510-1989 (Rev 1995) Testing of Nuclear Air Cleaning Systems
NUREG-0800 Standard Review Plan, Section 6.4, Section II, Items 1-5.
BNFL-5193-SRD-01, Appendix A, Implementing Standard for Safety Standards and Requirements Identification

**Regulatory Basis:**

*DOE/RL-96-0006 4.2.4.1 Emergency Preparedness-Support Facilities*
*DOE/RL-96-0006 4.2.6.2 Human Factors-Instrumentation and Control Design*
*29 CFR 1910.120 Hazardous Waste Operations and Emergency Response Location*

**Safety Criterion:** 4.5 - 22

The facility should have on file, and ready to use, a Pre-Fire Plan. The Pre-Fire Plan should assign individual and alternate responsibilities for responding to a fire alarm or call; assessing the situation, suppressing incipient fires, assembling the site Fire Brigade, and if necessary, requesting Hanford Site fire department assistance, personnel evacuation, orderly shutdown of processes, and safeguarding (if necessary) and control of radioactive and hazardous material.

The plan should clearly indicate, preferably with the help of site plans and drawings, the locations of the fire department-compatible connections and fire-fighting equipment, such as portable extinguishers, automatic fire suppression systems, sectional valves, standpipes, hydrants, and hoses. It should also indicate the areas of concentrations of combustibles, storages of flammable and combustible liquids, and areas where use of water for fire suppression is restricted because of nuclear criticality or other concerns.

The Pre-Fire Plan should be prepared in consultation and coordination with the Hanford Site fire department. The Hanford Site fire department personnel should be given familiarization tours of the facility at least once a year.

**Implementing Codes and Standards:**

DOE G-440.1 Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program
NFPA 801-95 Standard for Facilities Handling Radioactive Materials

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 4.2.3.1 Safety Analysis Reports

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**Safety Criterion:** 4.5 - 23

Hot work permits shall be issued for hot work operations conducted in or near the facility. The permit shall document that applicable fire prevention and protection requirements have been implemented prior to beginning the hot work operations; it shall indicate the date(s) authorized for hot work; and identify the object on which hot work is to be performed. The permit shall be kept on file until completion of the hot work operations.

**Implementing Codes and Standards:**

DOE G-440.1 Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program
NFPA 801-95 Standard for Facilities Handling Radioactive Materials

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 5.6.6 Hot Work Operations

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (k)*~~
*DOE/RL-96-0006 5.2.8 Hot Work Control*

# 6.0 Startup

**Safety Criterion:** 6.0 - 1

A pre-operational testing program shall be established and followed to demonstrate that Important to Safety structures, systems and components have been properly constructed and can perform their specified functions. The program shall provide for the detection, tracking, and correction of deficiencies.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 1.3.14 Startup Testing
Section: 3.14 Startup Testing and Operation
Section: 5.6.4 Startup Review

**Regulatory Basis:**

~~*29 CFR 1910 - Occupational Safety and Health Standards - Location: 119 (j) (6)*~~
*DOE/RL-96-0006 4.2.8.1 Pre-Operational Testing-Testing Program*

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**Safety Criterion:** 6.0 - 2

Procedures for normal facility and systems operation and for functional tests to be performed during the operating phase shall be validated as part of the pre-operational testing program.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 1.3.14 Startup Testing
Section: 3.14 Startup Testing and Operation
Section: 5.6.4 Startup Review

**Regulatory Basis:**

*DOE/RL-96-0006 4.2.8.2 Pre-Operational Testing-Operational Systems and Functional Testing Procedures Validation*

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**Safety Criterion:** 6.0 - 3

During pre-operational testing, detailed diagnostic data shall be collected on systems and components designated as Important to Safety and the initial operating parameters of the systems and components shall be recorded.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 1.3.14 Startup Testing
Section: 3.14 Startup Testing and Operation
Section: 5.6.4 Startup Review

**Regulatory Basis:**

*DOE/RL-96-0006 4.2.8.3 Pre-Operational Testing-Safety Systems Data*

**Safety Criterion:** 6.0 - 4

During the pre-operational testing program, the as-built operating characteristics of process systems, and systems and components designated as Important to Safety shall be determined and documented. Operating points shall be adjusted to conform to values in the design basis. Training procedures and limiting conditions for operation shall be modified, if necessary, to accurately reflect the operating characteristics of the systems and components as built.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 1.3.14 Startup Testing
Section: 3.14 Startup Testing and Operation
Section: 5.6.4 Startup Review

**Regulatory Basis:**

*DOE/RL-96-0006 4.2.8.4 Pre-Operational Testing-Design Operating Characteristics*

**Safety Criterion:** 6.0 - 5

A pre-startup safety review shall be performed. The pre-startup safety review shall confirm that, prior to the introduction of radioactive or process chemicals considered to pose a hazard to a process, construction and equipment is in accordance with design specifications; safety, operating, maintenance, and emergency procedures are in place and are adequate; a process hazard analysis has been performed and recommendations have been resolved or implemented before startup; and training of each employee involved in operating a process has been completed.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 1.3.14 Startup Testing
Section: 5.6.4 Startup Review

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (i)*~~
*DOE/RL-96-0006 4.3.1.4 Conduct of Operations-Readiness*
*DOE/RL-96-0006 5.2.6 Pre-startup Safety Review*

## 7.1 Management and Organization/Staffing

**Safety Criterion:** 7.1 - 1

Safety management shall oversee the implementation of the risk management program elements. A qualified person shall be assigned the overall responsibility for the development, implementation, and integration of the risk management program elements. If responsibility for implementing individual requirements of the risk management program is assigned to other persons, the names or positions of these people shall be documented and the lines of authority defined through an organization chart or similar document.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 6.1 Integration into Work Planning and Performance

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (p)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 15*~~

**Safety Criterion:** 7.1 - 2

When selecting a subcontractor, information regarding the subcontract employer's safety performance and programs shall be obtained and evaluated. Subcontract employees shall be informed of the known potential fire, explosion, or toxic release hazards related to the subcontractor's work and the process. The applicable provisions of the emergency plan shall be explained to the subcontractors. Safe work practices to control the entrance, presence and exit of subcontract employers and employees in radioactive or hazardous process areas shall be developed and implemented. The performance of subcontract employers with regard to safety shall be periodically evaluated and a subcontract employee injury and illness log related to the subcontractor's work in process areas shall be maintained.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 5.2 Control of Subcontractors

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (h)*~~
*DOE/RL-96-0006 5.2.5 Subcontractors*

**Safety Criterion:** 7.2 - 3

Each employee involved in operating a process shall be trained in an overview of the process and in the operating procedures/instructions. The training shall include emphasis on the specific safety and health hazards, operating limits, emergency operations including shutdown, and safe work practices applicable to the employee's job tasks.

Refresher training shall be provided at least every three years, and more often if necessary, to each employee involved in operating a process to assure that the employee understands and adheres to the current operating procedures/instructions of the process and is proficient in the procedures to follow if conditions exceed the design basis of the facility.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 5.6.3 Development of the Operator Training Program

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (g)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 54*~~
*DOE/RL-96-0006 4.3.4.1 Training and Qualifications-Personnel Training*
*DOE/RL-96-0006 4.3.4.3 Training and Qualifications-Conditions Beyond Design Basis*
*DOE/RL-96-0006 5.2.4 Training*
*WAC 246-247 Radiation Protection - Air Emissions Location: Part 075 (12)*

**Safety Criterion:** 7.2 - 4

Up-to-date records of training status shall be maintained which contain the names of the trained employees, the types of training, the dates of training, and the means used to verify that the employees understood the training.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 3.15 Training and Qualification
Chapter: 8.0 Document Control and Maintenance

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (g)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 54*~~

**Safety Criterion:** 7.2 - 5

Written procedures/instructions that provide clear direction for safely conducting activities involving radioactive or hazardous materials shall be developed and implemented for each phase of the facility life. The procedures/instructions shall address at least the following elements:

(1) Steps for each operating phase:
(a) Initial startup;
(b) Normal operations;
(c) Temporary operations;
(d) Emergency shutdown including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner.
(e) Emergency operations;
(f) Normal shutdown; and,
(g) Startup following a turnaround, or after an emergency shutdown.
(2) Operating limits:
(a) Consequences of deviation; and
(b) Steps required to correct or avoid deviation.
(3) Safety and health considerations:
(a) Properties of, and hazards presented by, the chemicals used in the process;
(b) Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment;
(c) Control measures to be taken if physical contact or airborne exposure occurs;
(d) Quality control for raw materials and control of hazardous chemical inventory levels; and,
(e) Any special or unique hazards.
(4) Safety systems and their functions.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 5.6.1 Procedure Development

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (f)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 52*~~
*DOE/RL-96-0006 4.3.2.2 Radiation Protection-Procedures and Monitoring*
*DOE/RL-96-0006 5.2.3 Operating Procedures*

**Safety Criterion:** 7.2 - 6

Operating procedures shall be readily accessible to employees who work in or maintain a process with radioactive or hazardous materials.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 5.6.1 Procedure Development

**Regulatory Basis:**

~~29 CFR 1910 - Occupational Safety and Health Standards - Location: 119 (f)~~
~~40 CFR 68 - Chemical Accident Prevention Provisions - Location: 52~~

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**Safety Criterion:** 7.2 - 7

Operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to facilities. These procedures shall be certified annually that they are current and accurate.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 5.3 Configuration Management
Section: 5.6.1 Procedure Development

**Regulatory Basis:**

~~29 CFR 1910 - Occupational Safety and Health Standards - Location: 119 (f)~~
~~40 CFR 68 - Chemical Accident Prevention Provisions - Location: 52~~

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**Safety Criterion:** 7.2 - 8

Safe work practices providing for the control of hazards during operations such as lockout/tagout; confined space entry; opening process equipment or piping; and control over entrance into a facility by maintenance, subcontractor, laboratory, or other support personnel shall be developed. These safe work practices shall apply to employees and subcontractor employees.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 3.4 Safety/Quality Culture
Section: 5.2 Control of Subcontractors
Section: 5.6.6 Hot Work Operations

**Regulatory Basis:**

~~29 CFR 1910 - Occupational Safety and Health Standards - Location: 119 (f)~~
~~40 CFR 68 - Chemical Accident Prevention Provisions - Location: 52~~

**Safety Criterion:** 7.3 - 7

Inspection and testing of specified items, services, and processes shall be conducted using established acceptance and performance criteria. Equipment used for inspections and tests shall be calibrated and maintained.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 1.3.11 Quality Levels

**Regulatory Basis:**

*10 CFR 830.120 Quality assurance requirements Location: (c)(2)(iv)*
~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (j) (6)*~~

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**Safety Criterion:** 7.3 - 8

Managers shall assess their management processes. Problems that hinder the organization from achieving its objectives shall be identified and corrected.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Chapter: 10.0 Assessments

**Regulatory Basis:**

*10 CFR 830.120 Quality assurance requirements Location: (c)(3)(i)*

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**Safety Criterion:** 7.3 - 9

Independent assessment shall be planned and conducted to measure item and service quality, to measure the adequacy of work performance, and to promote improvement. The group performing independent assessments shall have sufficient authority and freedom from the line to carry out its responsibilities. Persons conducting independent assessments shall be technically qualified and knowledgeable in the areas assessed.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Chapter: 10.0 Assessments

**Regulatory Basis:**

*10 CFR 830.120 Quality assurance requirements Location: (c)(3)(ii)*

**Safety Criterion:** 7.3 - 10

Compliance audits shall be performed at least every three years to verify that the procedures and practices developed to ensure nuclear and process safety are adequate and are being followed. The compliance audit shall be conducted by at least one person knowledgeable in the process. A report of the findings of the audit shall be developed. An appropriate response shall be determined and documented for each of the findings of the compliance audit, and it shall be documented when deficiencies have been corrected. Employers shall retain the two most recent compliance audit reports.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 5.4 Compliance Audits
Chapter: 8.0 Document Control and Maintenance

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (e)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 58*~~
*DOE/RL-96-0006 5.2.12 Compliance Audits*

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**Safety Criterion:** 7.3 - 11

Procured items and services shall meet established requirements and perform as specified.

Prospective suppliers shall be evaluated and selected on the basis of specified criteria. Processes to ensure that approved suppliers continue to provide acceptable items and services shall be established and implemented.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 2.2 Compliance with 10 CFR 830.120, "Quality Assurance Requirements"

**Regulatory Basis:**

*10 CFR 830.120 Quality assurance requirements Location: (c)(2)(iii)*
~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (j) (6)*~~

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**Safety Criterion:** 7.3 - 12

Changes made to the Quality Assurance Program (QAP) shall be submitted annually to the regulator for review. The submittal shall identify the changes, the pages affected, the reason for the changes, and the basis for concluding that the revised QAP continues to satisfy the requirements of this section.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 3.3.3 Changes to Safety Documentation

**Regulatory Basis:**

*10 CFR 830.120 Quality assurance requirements Location: (b)(3)*

## 7.4 Unreviewed Safety Questions

**Safety Criterion:** 7.4 - 1

A safety evaluation shall be performed to determine whether a situation involves an unreviewed safety question (USQ) for:
(1) Temporary or permanent changes in the facility as described in the existing authorization basis;
(2) Temporary or permanent changes in the procedures as derived from existing authorization basis; or
(3) Tests or experiments not described in the existing authorization basis.

A situation involves a USQ if:
1) the probability of occurrence or the radiological or chemical consequences of an accident or malfunction of equipment Important to Safety, previously evaluated in the facility safety analyses or other related safety analysis and evaluations not yet included in the updated facility analysis, may be increased;
2) a possibility for an accident or equipment malfunction of a different type than any evaluated previously in the facility safety analyses or other related safety analysis and evaluations not yet included in the updated facility safety analysis, may be created; or
3) any margin of safety is reduced.

**Implementing Codes and Standards:**
BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 3.16.4 Unreviewed Safety Questions

**Regulatory Basis:**

*DOE/RL-96-0006 4.4.4 Unresolved Safety Questions*
*DOE/RL-96-0006 5.2.9 Management of Change*

**Safety Criterion:** 7.4 - 2

Regulatory approval shall be obtained for situations determined to involve an unreviewed safety question or a change in a technical safety requirement, prior to initiating the activity, if the initiation of the activity would itself involve a USQ, or implementing the proposed change.

**Implementing Codes and Standards:**
BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 3.16.4 Unreviewed Safety Questions

**Regulatory Basis:**

*DOE/RL-96-0006 4.4.4 Unresolved Safety Questions*

## 7.6 Maintenance

**Safety Criterion:** 7.6 - 1

A maintenance program for the facility shall be developed and implemented using a tailored approach.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 4.2.1 Engineered Features

**Safety Criterion:** 7.6 - 2

The maintenance program shall contain provisions sufficient to preserve, predict, and restore the availability, operability, and reliability of structures, systems, and components designated as Important to Safety.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 3.13 Reliability, Availability, Maintainability, and Inspectability (RAMI)

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (j) (5)*~~
*DOE/RL-96-0006 4.3.5.1 Operational Testing, Inspection, and Maintenance-Operational Testing, Inspection, and*

**Safety Criterion:** 7.6 - 3

The maintenance program for Important to Safety Structures, systems and components shall clearly define:
(1) The Important to Safety structures, systems, and components that comprise the facility;
(2) The requirements of the maintenance program that are derived from the program elements listed in Safety Criterion 7.6-4.
(3) The management systems used for those activities, including the means for monitoring and measuring the effectiveness of the program and the management of maintenance backlog;
(4) The assignment of responsibilities and authority for all levels of the maintenance organization,
(5) Mechanisms to feedback such relevant information as trend analysis and instrumentation performance/reliability data in order to identify necessary program modifications,
(6) Provisions for identifying and evaluating possible component, system design, occupational safety and health, or other relevant problems and implementation of a self-assessment program;
(7) Performance indicators and criteria to be utilized to measure equipment, systems, and personnel effectiveness in maintenance activities;
(8) Interfaces between maintenance and other organizations (e.g., involving operations, engineering, quality, and safety); and
(9) Quantitative reliability target values for systems and components to start or run, when such values are credited in safety analysis.
(10) Appropriate authorization is received before modification starts on a safety instrumented system.
(11) Assessment of impact of the modification on the functionality of the safety instrumented system is performed, to ensure functionality is not impaired.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 1.3.10 Classification of Structures, Systems, and Components
Section: 3.2 Safety Responsibilities
Section: 3.4 Safety/Quality Culture
Section: 3.13 Reliability, Availability, Maintainability, and Inspectability (RAMI)
Section: 3.16.3 Incident Investigations
Section: 3.16.5 Performance Monitoring
Section: 3.16.6 Performance Indicators

Section: 3.16.8 Feedback and Trending
Chapter: 10.0 Assessments
BNFL-5193-SRD-01, Attachment A Implementing Standard for Safety Standards and Requirements Identification

**Regulatory Basis:**

*DOE/RL-96-0006 4.2.7.1 Reliability, Availability, Maintainability, and Inspectability(RAMI)-Reliability*
*DOE/RL-96-0006 4.3.5.1 Operational Testing, Inspection, and Maintenance-Operational Testing, Inspection, and Maintenace*

**Safety Criterion:** 7.6 - 4

The maintenance program shall address each of the following elements:
(1) Organization and administration;
(2) Maintenance training and qualification;
(3) Maintenance facilities, equipment, and tools;
(4) Types of maintenance;
(5) Maintenance procedures and other work-related documents;
(6) Planning, scheduling, and coordinating maintenance activities;
(7) Control of maintenance activities;
(8) Postmaintenance testing;
(9) Procurement of parts, materials, and services;
(10) Material receipt, inspection, handling, storage, retrieving, and issuance;
(11) Control and calibration of measuring and test equipment;
(12) Maintenance tools and equipment control;
(13) Documented facility condition inspections to identify and address aging effects;
(14) Management involvement with facility operations;
(15) Maintenance history and trending;
(16) Analysis of maintenance-related problems;
(17) Modification work.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 1.3.11 Quality Levels
Section: 4.2.2 Training and Procedures
Section: 5.3 Configuration Management
Section: 5.4 Compliance Audits
Section: 5.6.5 Mechanical Integrity
Chapter: 11.0 Organization Roles, Responsibilities and Authorities

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (j) (2)*~~
~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (j) (3)*~~
~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (j) (4)*~~
~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (j) (6)*~~
*40 CFR 61 National Emission Standards for Hazardous Air Pollutants Location: 14 (b)*
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 56*~~
*DOE/RL-96-0006 4.3.5.1 Operational Testing, Inspection, and Maintenance-Operational Testing, Inspection, and*
*DOE/RL-96-0006 5.2.7 Mechanical Integrity*
*WAC 246-247 Radiation Protection - Air Emissions Location: Part 075 (12)*

## 7.7 Reporting and Incident Investigation

**Safety Criterion:** 7.7 - 1

Each incident which resulted in, or could reasonably have resulted in a major accident shall be investigated. An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 1.3.17 Incident Investigations
Section: 5.6.7 Investigations of Incidents

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (m)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 60*~~
*DOE/RL-96-0006 5.2.10 Incident Investigation*

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**Safety Criterion:** 7.7 - 2

An incident investigation team shall be established and consist of at least one person knowledgeable in the process involved, including a subcontract employee if the incident involved work of the subcontractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident. A report shall be prepared at the conclusion of the investigation which includes at a minimum:

(1) Date of incident;
(2) Date investigation began;
(3) A description of the incident;
(4) The factors that contributed to the incident; and,
(5) Any recommendations resulting from the investigation.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 1.3.17 Incident Investigations
Section: 5.6.7 Investigations of Incidents
Chapter: 8.0 Document Control and Maintenance

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (m)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 60*~~
*DOE/RL-96-0006 5.2.10 Incident Investigation*

**Safety Criterion:** 7.7 - 3

A system shall be established to promptly address and resolve the incident report findings and recommendations. Resolutions and corrective actions shall be documented. The report shall be submitted to the regulator for evaluation and in support of regulatory oversight. The report shall be reviewed with all affected personnel whose job tasks are relevant to the incident findings including subcontract employees where applicable. Incident investigation reports shall be retained for five years.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 5.6.7 Investigations of Incidents

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (m)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 60*~~
*DOE/RL-96-0006 5.2.10 Incident Investigation*

**Safety Criterion:** 7.7 - 4

The Facility Manager shall categorize reportable incidents as soon as reasonably possible and in all cases within 2 hours of identification of the event or condition. If categorization is not clear, the occurrence shall be conservatively categorized at the higher level being considered. The occurrence categorization shall be elevated, maintained, or lowered, as appropriate, as further information is obtained.

Reportable occurrences shall be categorized in accordance with the following guidance:

"Emergencies" are the most serious reportable occurrences and they require an increased alert status for on-site personnel and, in specified cases, for off-site authorities. Emergencies require a time-urgent notification as part of the facility's comprehensive emergency management program.

"Unusual Occurrences" are the category of nonemergency reportable occurrences that exceed the off-normal occurrence threshold and have significant impact or potential for impact on safety, the environment, health, safeguards and security, or operations.

"Off-Normal Occurrences" are the category of abnormal or unplanned reportable occurrences that adversely affect, potentially affect, or are indicative of degradation in the level of safety, safeguards and security, environmental or health protection, performance or operation of the facility.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 5.6.7 Investigations of Incidents

## 7.8 Emergency Preparedness

**Safety Criterion:** 7.8 - 1

An emergency response program shall be developed, documented, and implemented for the purpose of protecting public health and the environment. The program shall include the following elements:

(1) An emergency response plan;
(2) Emergency Planning Implementing Procedures to ensure the timely and effective implementation of the provisions of the emergency plan;
(3) A facility emergency response organization, with clearly defined roles, responsibilities and authorities.
(4) A training program that provides initial and annual refresher training for facility response personnel, general employees, and response personnel from other agencies.
(5) Program administration to include maintenance of technical support documents, plans, and procedures, the coordination of activities, and maintenance of appropriate auditable records.
(6) Adequate emergency facilities and equipment to support response.
(7) The scope of the program will be designed to be commensurate with the hazards present at the facility and will be determined by performing an assessment of the hazards.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 3.10 Emergency Preparedness
Chapter: 8.0 Document Control and Maintenance

**Regulatory Basis:**

~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 95*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 180*~~
*WAC 246-247 Radiation Protection - Air Emissions Location: Part 075 (12)*

**Safety Criterion:** 7.8 - 2

The Emergency Management Program will be documented in an emergency plan which describes the provisions for responses to Operational Emergencies. The emergency response plan will address the following program elements;
(1) The establishment and maintenance of a facility emergency response organization with clearly specified authorities and responsibilities for emergency response and mitigation.
(2) Provisions for interfaces and coordination with Hanford Site and offsite agencies in the areas of planning, preparedness, response, and recovery.
(3) A description of the hazards and potential consequences resulting from analyzed accidents.
(4) Identify and describe the capabilities for the detection of emergency events, the methodology for determining event severity and the basis for declaring an emergency.
(5) The methods to be used to provide notification of an emergency event to Hanford Site organizations, offsite response agencies, and Federal, state and local regulatory agencies.
(6) Provisions for assessing the consequences resulting from the release of hazardous materials.
(7) A description of protective actions for responders, workers, and the public, to include provisions for sheltering, evacuation, and personnel accountability.
(8) Medical support during emergency response, to include provisions for ambulance/hospital services and decontamination of injured personnel.
(9) Methodology for the safe-shut down of the facility, reentry to the facility during or after emergency response and provisions for developing a recovery strategy following an accident.
(10) A public information program designed to provide the public, media and employees with accurate and timely information.
(11) A training program will de designed to ensure that personnel are prepared to respond to, manage, mitigate, and recover from emergencies associated with facility operations.
(12) Provisions for the administration of the program, to include a designated program administrator, program assessment and issue resolution, the development and maintenance of technical support documents, plans, and procedures, the coordination of activities, and maintenance of appropriate auditable records.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 3.10 Emergency Preparedness

**Regulatory Basis:**

~~*29 CFR 1910 Occupational Safety and Health Standards Location: 119 (n)*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 95*~~
~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 180*~~
*DOE/RL-96-0006 4.1.2.3 Safety Responsibility-Site and Technical Support*
*DOE/RL-96-0006 5.2.11 Emergency Planning and Response*

**Safety Criterion:** 7.8 - 3

Emergency plans shall be prepared before the startup of the facility, and shall be exercised periodically to ensure that protection measures can be implemented in the event of an accident that results in, or has the potential for, unacceptable releases of radioactive materials within and beyond the facility control perimeter.

A determination shall be made of the size of the geographic area surrounding the facility, known as the Emergency Planning Zone (EPZ), within which special planning and preparedness activities will be performed to reduce the potential health and safety impacts from an event involving hazardous materials. The extent of planning and preparedness necessary shall correspond to the type and scope of hazards present and the potential consequences of events.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 1.3.18 Emergency Planning
Section: 3.10 Emergency Preparedness

**Regulatory Basis:**

*DOE/RL-96-0006 4.3.3.3 Emergency Preparedness-Establishment and Continued Exercise of Emergency Plans*

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**Safety Criterion:** 7.8 - 4

The results of analyses of the facility response to accidents with the potential for releases resulting in doses in excess of Environmental Protection Agency and the State of Washington emergency clean-up standards, beyond the TWRS-P controlled area boundary shall be used in preparing emergency operating procedures which will contain specific instructions for facility operations personnel on the shutdown of facility processes and the mitigation of accidents for all identified off-normal and emergency conditions.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 3.10 Emergency Preparedness

**Regulatory Basis:**

*DOE/RL-96-0006 4.3.3.2 Emergency Preparedness-Accident Management Strategy*

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**Safety Criterion:** 7.8 - 5

The emergency response plan shall be coordinated with the DOE Hanford Site and local community emergency response plans.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 3.10 Emergency Preparedness

**Regulatory Basis:**

~~*40 CFR 68 Chemical Accident Prevention Provisions Location: 95*~~
*DOE/RL-96-0006 4.3.3.1 Emergency Preparedness-Offsite Measures*

**Safety Criterion:** 9.1 - 6

All responsibilities concerning the facility as identified in the approved SAR shall be carried out.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Section: 3.2 Safety Responsibilities

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**Safety Criterion:** 9.1 - 7

The hazard analysis shall be submitted for approval as part of the SAR. Hazard analysis data shall also be submitted as part of the Risk Management Plan, as discussed in Safety Criterion 9.3-1.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Chapter: 9.0 Scheduling of Safety-Related Activities

**Regulatory Basis:**

~~*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 175*~~

## 9.3 Risk Management Plan

**Safety Criterion:** 9.3 - 1

A single risk management plan (RMP) shall be submitted to the EPA. The plan shall include:
(1) An executive summary;
(2) A registration form covering all regulated substances handled in covered processes;
(3) Offsite consequence analyses (one worst case scenario to represent all toxics held above the threshold quantity, one worst case scenario to represent all regulated flammables held above the threshold quantities, alternative release scenarios for each regulated toxic substance held above the threshold quantity and one alternative release scenario to represent all regulated flammable substances held above the threshold quantity);
(4) The five-year accident history;
(5) Prevention program elements described below:
- (a) SIC code for the process,
- (b) Name(s) of the substance(s) covered,
- (c) Date on which the safety information was last reviewed or revised,
- (d) Date of completion of the most recent PHA or update and the technique used,
  - (i) Expected date of completion of any changes resulting from the PHA,
  - (ii) Major hazards identified,
  - (iii) Process controls in use,
  - (iv) Mitigation systems in use,
  - (v) Monitoring and detection systems in use,
  - (vi) Changes since the last PHA.
- (e) Date of the most recent review or revision of the operating procedures,
- (f) Date of the most recent review or revision of the training procedures,
  - (i) The type of training provided,
  - (ii) The type of competency testing used.
- (g) Date of the most recent review or revision of maintenance procedures and the date of the most recent equipment inspection or test and the equipment inspected or tested,
- (h) Date of the most recent change that triggered management of change procedures and the date of the most recent review or revision of managment of change procedures,
- (i) Date of the most recent pre-startup review,
- (j) Date of the most recent compliance audit and the expected date of completion of any changes resulting from the compliance audit,
- (k) Date of the most recent incident investigation and the expected date of completion of any changes resulting from the investigation,
- (l) Date of the most recent review or revision of employee participation plans,
- (m) Date of the most recent review or revision of subcontractor safety procedures, and
- (n) Date of the most recent evaluation of subcontractor safety performance.

(6) Information on the emergency response program:
- (a) Is there a written plan?
- (b) Does the plan include specific actions to be taken in response to an accidental releases of a regulated substance?
- (c) Does the plan include procedures for informing the public and local agencies responsible for responding to accidental releases?
- (d) Does the plan include information on emergency health care?
- (e) The date of the most recent review or update of the emergency response plan;
- (f) The date of the most recent emergency response training for employees.
- (g) The name and telephone number of the local agency with which the plan is coordinated.
- (h) The other Federal or state emergency plan requirements to which the facility is subject.

(7) Certification that, to the best of the signer's knowledge, information, and belief formed after reasonable inquiry, the information submitted is true, accurate, and complete.

**Implementing Codes and Standards:**
BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Chapter: 5.0 Process Safety Management

**Regulatory Basis:**

*40 CFR 61 - National Emission Standards for Hazardous Air Pollutants - Location: 104*
*40 CFR 61 - National Emission Standards for Hazardous Air Pollutants - Location: 105*
*40 CFR 61 - National Emission Standards for Hazardous Air Pollutants - Location: 95*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 12*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 22*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 28*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 42*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 150*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 155*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 160*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 165*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 168*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 175*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 180*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 185*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 200*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 220*
*WAC 173-480 - Ambient Air Quality Standards and Emission Limits for Radionuclides - Location: Part 070*

**Safety Criterion:** 9.3 - 2

The RMP shall be reviewed and updated as follows:

(1) Within five years of its initial submission or most recent update required by paragraphs (2) through (7) of this section, whichever is later.

(2) No later than three years after a newly regulated substance is first listed by EPA;

(3) No later than the date on which a new regulated substance is first present in an already covered process above a threshold quantity;

(4) No later than the date on which a regulated substance is first present above a threshold quantity in a new process;

(5) Within six months of a change that requires a revised PHA or hazard review;

(6) Within six months of a change that requires a revised offsite consequence analysis; and

(7) Within six months of a change that alters the Program level that applied to any covered process.

If a stationary source is no longer subject to this part (40 CFR Part 68), a revised registration shall be submitted to EPA within six months indicating that the stationary source is no longer covered.

**Implementing Codes and Standards:**
BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Chapter: 5.0 Process Safety Management

**Regulatory Basis:**

*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 190*

**Safety Criterion:** 9.3 - 3

The following scenarios shall be analyzed for offsite consequences and reported in the Risk Management Plan (RMP):

- one worst-case release scenario that is estimated to create the greatest distance in any direction to an endpoint resulting from an accidental release of regulated toxic substances from covered processes under worst-case conditions,
- one worst-case release scenario that is estimated to create the greatest distance in any direction to an endpoint resulting from an accidental release of regulated flammable substances from covered processes under worst-case conditions;
- additional worst-case release scenarios for a hazard class if a worst-case release from another covered process at the stationary source potentially affects public receptors different from those potentially affected by the worst-case release scenarios;
- at least one alternative release scenario for each regulated toxic substance held in a covered process(es) and at least one alternative release scenario to represent all flammable substances held in covered processes (scenarios selected shall be more likely to occur than the worst-case release scenario(s) and shall reach an endpoint offsite, unless no such scenario exists).

The population within a circle with its center at the point of the release and a radius determined by the distance to the endpoint shall be estimated. Population shall include residential population. The presence of institutions (schools, hospitals, prisons), parks and recreational areas, and major commercial, office, and industrial buildings shall be noted in the RMP. The environmental receptors within a circle with its center at the point of the release and a radius determined by the distance to the endpoint shall be listed in the RMP.

Endpoints. For analyses of offsite consequences, the following endpoints shall be used:

- (1) Toxics. The toxic endpoints provided in Appendix A of 40 CFR 68.
- (2) Flammables. The endpoints for flammables vary according to the scenarios studied:
- (i) Explosion. An overpressure of 1 psi.
- (ii) Radiant heat/exposure time. A radiant heat of 5 kw/m[2] for 40 seconds.
- (iii) Lower flammability limit. A lower flammability limit as provided in NFPA documents or other generally recognized sources.

**Implementing Codes and Standards:**

BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan
Chapter: 5.0 Process Safety Management

**Regulatory Basis:**

*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 20*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 22*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 25*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 30*
*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 33*

~~**Safety Criterion:** 9.3 - 4~~

~~The following records on the offsite consequence analyses shall be maintained:~~

~~(1) For worst-case scenarios, a description of the vessel or pipeline and substance selected as worst case, assumptions and parameters used, and the rationale for selection; assumptions shall include use of any administrative controls and any passive mitigation that were assumed to limit the quantity that could be released. Documentation shall include the anticipated effect of the controls and mitigation on the release quantity and rate.~~

~~(2) For alternative release scenarios, a description of the scenarios identified, assumptions and parameters used, and the rationale for the selection of specific scenarios; assumptions shall include use of any administrative controls and any mitigation that were assumed to limit the quantity that could be released. Documentation shall include the effect of the controls and mitigation on the release quantity and rate.~~

~~(3) Documentation of estimated quantity released, release rate, and duration of release.~~

~~(4) Methodology used to determine distance to endpoints.~~

~~(5) Data used to estimate population and environmental receptors potentially affected.~~

~~**Implementing Codes and Standards:**~~

~~BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan~~

~~Chapter: 5.0 Process Safety Management~~

~~**Regulatory Basis:**~~

~~*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 39*~~

~~**Safety Criterion:** 9.3 - 5~~

~~The offsite consequence analyses shall be reviewed and updated at least once every five years. If changes in processes, quantities stored or handled, or any other aspect of the stationary source might reasonably be expected to increase or decrease the distance to the endpoint by a factor of two or more, a revised analysis shall be completed within six months of the change and a revised risk management plan submitted.~~

~~**Implementing Codes and Standards:**~~

~~BNFL-5193-ISP-01 TWRS-P Project Integrated Safety Management Plan~~

~~Chapter: 5.0 Process Safety Management~~

~~**Regulatory Basis:**~~

~~*40 CFR 68 - Chemical Accident Prevention Provisions - Location: 36*~~

The potential consequences of releases of hazardous chemicals shall also be assessed. The assessment shall consider both the inherent hazard of the chemical itself, and the potential for the chemical hazard to initiate or exacerbate a radiological hazard~~These hazards shall be subject to the graded application of the Process Safety Management (PSM) rule. If the type and quantity of chemical involved could result in concentrations equivalent to ERPG 2, for example, the full extent of the PSM rule shall be applicable~~.

### 4.3.2 Accident Analysis

Accident analyses provide confirmation that the design satisfies the radiological and process standards in the SRD. Accident analyses also provide confirmation of the severity levels assigned to potential accidents.

The formal accident analyses shall address design basis external events and natural phenomena as well as postulated internal events.

The postulated internal events shall be grouped by type. Accident types applicable to the TWRS-P include the following:

- Liquid spills
- Spills of solid materials
- Pressurized releases
- Chemical reactions
- Boiling
- Flammable gas ignition (e.g., hydrogen in air)
- Fires
- Load drops
- Radiation exposure
- Criticality

As a minimum, the accident analysis shall address the most severe credible event of each type.

Initially, the accident analysis shall evaluate the unmitigated consequences of the postulated accidents. As control strategies are developed, the accident analysis shall also evaluate the impact of the SSCs that implement the control strategy on the potential consequences.

The accident analysis shall consider the following factors:

- Inventory of material at risk in the scenario.
- The respirable release fraction for the accident scenario. This is a function of the composition of the material at risk, of the form of the material, and of the interaction between the material at risk and the energy available in the accident scenario.
- The fraction of the airborne material released to potentially occupied locations or the environment.

Consistent with the defense in depth principle, the control strategy development should emphasize preventive measures. It should also emphasize passive SSCs over active SSCs and retention of released material over dispersion. Ideally, the preferred control strategy should incorporate SSCs that prevent releases and SSCs that mitigate the consequences of a release, should it occur.

Once the preferred control strategy is identified, it shall be evaluated using the techniques described in Section 4.3 through 4.5. In addition, the evaluation of the control strategy shall identify the measures necessary to assure that it performs its functions reliably. Such measures include maintenance requirements, testing intervals and calibration frequency. The results of this evaluation serve to confirm that the control strategy is capable of satisfying SRD Safety Criteria 2.0-1.

If credit is taken for operator action to satisfy the public radiological exposure standards of Safety Criterion 2.0-1, adequate radiation protection is provided to permit access and occupancy of the control room or other control locations under accident conditions without personnel receiving radiation doses in excess of 5 rem TEDE whole body gamma and 30 rem beta skin for the duration of the accident. If credit is taken for operator action to satisfy public chemical exposure to ~~EPRG-2 limits~~the standards of SC 2.0-2, provisions for operational access and control are made so that the operator exposure does not exceed the ~~EPRG-2~~ limits specified in SC 4.3-7.

Documentation of the hazard control strategy development process shall be a narrative defining the overall approach to control a specific pre-identified hazard. The control strategy should be described in terms of the safety functions required (e.g., limit release of radionuclides, etc.) and in terms of a set of engineered features, administrative controls (procedures and training), and management systems selected for implementing the strategy. The documentation should identify all control strategies considered and provide a defensible rationale for selection of the preferred strategy.

The following information produced by the control strategy definition shall be recorded in the hazard database:

- Preferred control strategy
- Rationale for preferred control strategy selection
- Defense in depth provided
- Control strategy functions and performance requirements
- Estimate of the unmitigated event frequency
- Estimate of the consequences from the mitigated event
- Estimate of the mitigated event frequency
- Applicable design basis events (e.g., design basis earthquake)

This information in the hazard database links the specific hazards to specific control strategies.